BULLETIN

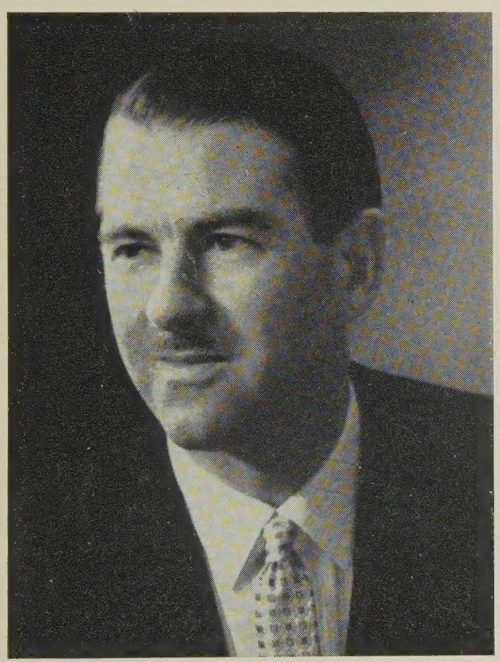
OF THE INSTITUTE OF METALS

VOLUME 5 MAY 1961 PART 21

INSTITUTE NEWS

Appointment of Secretary

As Members have already been informed by letter, Mr. R. E. MOORE has been appointed to succeed Lieut.-Colonel S. C. GUILLAN, T.D., who retired on 1 May 1961 after fifty years of devoted and successful service.



Mr. Moore, who has been Assistant Secretary since 1947, was born in India in 1917, and was educated at Tonbridge School. For four years before the Second World War he worked with a firm of solicitors of Gray's Inn and in 1939 joined the Royal Artillery as a gunner. After three and a half years of war service, spent mostly in India and Burma with the 14th Army, he was demobilized in 1945 with the rank of Major.

In 1946 Mr. Moore became Assistant to the Registrar of the Institution of Metallurgists (Dr. Harold Moore) and thus acquired some knowledge of the professional organization with which the Institute is now co-operating more closely. On July 1, 1947 he was appointed Assistant Secretary of the Institute of Metals and has since become well known to the Council and to Members.

Co-operation with The Iron and Steel Institute and The Institution of Metallurgists

Prolonged discussions during 1960 have resulted in complete agreement between the Councils of The Iron and Steel Institute, The Institute of Metals, and The Institution of Metallurgists on the best way to assure that the three societies work more closely together, avoid overlapping and duplication in their activities, and provide improved services for members.

A Joint Consultative Committee has been set up. This will keep under review all matters of common interest and advise the Councils on appropriate action.

The three Councils are convinced that it is in the interests of the profession and of their members that metallurgists shall be members both of the professional Institution and of the appropriate scientific and technical Institute. Accordingly, it has been agreed that, as from 1 January 1962, there shall be joint subscriptions to cover membership of the Institution and of one or both Institutes. The agreed rates are set out in the table on next page. They will apply, subject to election by the Institutes, to all members of the Institution resident in the United Kingdom and optionally to members resident overseas.

The Councils of The Iron and Steel Institute and The Institute of Metals recognize that this decision is likely to result in a considerable increase in the membership of the two Institutes. The Council of The Institute of Metals welcome this and hope that the service which the Institute provides will be satisfactory to new as well as to old members. It is their constant endeavour to improve this service. At the same time, they think it is appropriate to point out that the agreed subscription rates will involve the Institute in some financial sacrifice owing to the high cost of servicing members. Nevertheless, they are firmly convinced that the agreed policy is right and in the best interests of the membership of The Institute of Metals as a whole as well as of those engaged in the science and practice of metallurgy. The proposals provide for joint subscriptions roughly comparable to those payable by members of other institutions which provide similar services, and also include reduced rates for those who are younger and in the lower grades of membership of the Institution.

The Council hopes that, now that this scheme for closer co-operation has been introduced, professional metallurgists who are not yet members of the Institution will decide to apply for membership.

The three Councils have agreed that, as from January 1962, the subscription payable by each member of The Institution of Metallurgists resident in the United Kingdom (and optionally by members resident outside the United Kingdom) shall include also the subscription payable to either The Iron and Steel Institute or The Institute of Metals or to both Institutes.

Grade of Membership in The Institution of Metallurgists	Grade of Membership in The Institute of Metals	Annual Subscription Payable by an Individual Who is:			
		A Member of The Institute of Metals and of The Institution of Metallurgists		A Member of The Iron and Steel Institute and of The Institute of Metals and of The Institution of Metallurgists	
		Rate as from 1/1/62	Present Rate	Rate as from 1/1/62	Present Rate
		£ s. d.	£ s. d.	£ s. d.	£ s. d.
Fellows	Ordinary Member	9 10 0	9 9 0	14 0 0	14 3 6
Associates					
*aged 28 or more	Ordinary Member	6 10 0	7 7 0	9 15 0	12 1 6
*aged 25–27	Junior Member	5 0 0	5 5 0	7 15 0	8 3 0
Licentiates					
*aged 28 or more	Ordinary Member	5 0 0	5 19 6	8 0 0	10 14 0
*aged 25–27	Junior Member	4 0 0	3 17 6	6 10 0	6 15 6
*aged 24 or less	Student Member	2 10 0	2 16 0	4 0 0	4 7 0
Graduates					
*aged 28 or more	Ordinary Member	3 15 0	5 14 6	6 0 0	10 9 0
*aged 25–27	Junior Member	3 0 0	3 12 6	5 0 0	6 10 6
*aged 24 or less	Student Member	2 10 0	2 11 0	4 0 0	4 2 0
Students					
*aged 28 or more	Ordinary Member	3 15 0	5 9 6	6 0 0	10 4 0
*aged 25–27	Junior Member	3 0 0	3 7 6	5 0 0	6 5 6
*aged 24 or less	Student Member	2 0 0	2 6 0	3 5 0	3 16 0

* At 1 January in the subscription year in question.

Election of Members

The following 8 Ordinary Members, 1 Junior Member, and 10 Student Members were elected on 16 March 1961:

As Ordinary Members

EVANS, William Edward, Consultant, 85 Norbiton Hall, Kingston-upon-Thames.

HIRSCH, Peter Bernhard, M.A., Ph.D., A.Inst.P., Lecturer in Physics, University of Cambridge.

KAPOOR, Rajendra Kumar, Yale and Towne Manufacturing Co., Ltd., Foundry Section, Wednesfield.

KIRCHOF, Elizabeth H., B.A., Technical Librarian, Universal Cyclops Steel Corp., Bridgeville, Pa., U.S.A.

KRAWCZYK, Wladyslaw, Dipl.-Ing., Metallurgist, Bureau du Commissaire du Gouvernement pour l'Utilisation de l'Energie Nucleaire, Palac Kultuyr i Nauk, Warsaw, Poland.

MURPHY, William J., M.S., Ph.D., Head, Alloy Steel Section, Applied Research Laboratory, United States Steel Corp., Monroeville, Pa., U.S.A.

STRANDELL, *Professor* P. Olof, M.E.D., Professor and Head of the Department for Metal Working, Royal Institute of Technology, Stockholm, Sweden.

WATKINS, Clive Valentine, General Manager, Rolling and Tube Mills, Evered and Co., Ltd., Smethwick.

As Junior Members

WERT, James J., M.S., Ph.D., Research Scientist, Long-Range Research, A. O. Smith Corp., Milwaukee, Wis., U.S.A.

As Student Members

BRAMFITT, Bruce Livingstone, B.S.Met.E., Graduate Student, Department of Metallurgical Engineering, School of Mines and Metallurgy, University of Missouri, Rolla Mo., U.S.A.

CHU, Gordon P. K., M.S., Graduate Student, Ceramic Engineering Department, School of Mines and Metallurgy, University of Missouri, Rolla, Mo., U.S.A.

COLEMAN, Christopher Edward, Undergraduate, Department of Metallurgy, King's College, University of Durham.

EPPINGER, Edwin Vincent, Student, School of Mines and Metallurgy, University of Missouri, Rolla, Mo., U.S.A.

FLETCHER, Gordon, 24 Monument Terrace, Washington, Co. Durham.

HANDISYDE, Paul, Undergraduate, Department of Metallurgy, University of Cambridge.

KUO-CHIN CHUANG, Graduate Student, Department of Metallurgy, School of Mines and Metallurgy, University of Missouri, Rolla, Mo., U.S.A.

MITKO, Andrzej, Student, Battersea College of Advanced Technology, London.

RHODES, (Miss) Judith, Undergraduate, Department of Metallurgy, University of Birmingham.

SATHGURUNATH, V. A., Graduate Apprentice, Blooming Mill Office, Hindustan Steels, Ltd., Durgapur, India.

"Metallurgical Reviews" No. 21

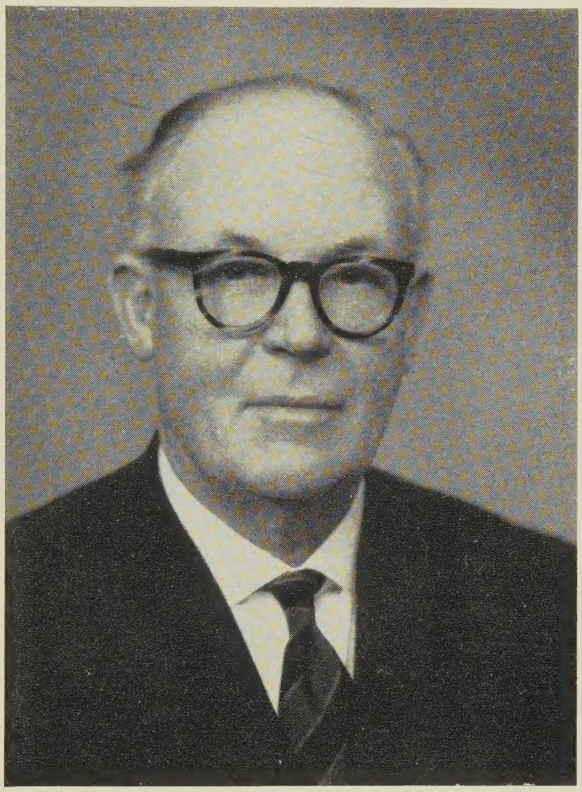
The latest issue of *Metallurgical Reviews* contains: "Poisson's Ratio for Metals and Alloys", by Werner Köster and H. Franz; "Fundamentals of the Solidification of Metals", by W. C. Winegard; and "The Stress-Cracking of Brass", by A. R. Bailey.

Metallurgical Reviews, published quarterly, is available only by subscription, the rates being: members 32*s.* 6*d.* ($5.00) post free; non-members 50*s.* ($7.50), post free.

Lieut.-Colonel S. C. Guillan, T.D.: An Appreciation

It came as something of a surprise, at least to those of us who are much older than Colonel Guillan, to learn that he had reached a retiring age. He has now handed over to his successor the heavy duties and responsibilities of the Secretaryship. Complete agreement among the Institute's members is rare, but it is very safe to say that we are united in our good wishes to him in his retirement.

Charles Guillan was born in London in 1895. His father, a silk merchant, wished him to enter his business, but this was distasteful to him and in 1911 he became a junior assistant to Mr. G. Shaw Scott, Secretary of The Institute of Metals from its foundation in 1908 until his retirement in 1944. In 1911 the Institute was a small and struggling body with about 600 members. From the first, Guillan took a special interest in its publications and this concern in a vital activity has never flagged; it became a powerful factor in the growth and progress of the Institute. He began to study metallurgy under C. O. Bannister at the Sir John Cass Institute in the City, but in August 1914 he joined the Army. From 1915 to the end of the war he served in the Norfolk Regiment in Mesopotamia, where he was twice wounded. He took part in the operations for the relief of Kut and the advance to Baghdad. There was much sickness in this campaign and he spent his 21st birthday in a cholera camp. After some service in India he rejoined the Institute's staff in 1920.



Dr. R. S. Hutton was then an active member of Council and its Publication Committee, keenly interested as always in the dissemination of scientific knowledge—his latest paper on the subject was published in March 1961. He infected Guillan with an equal enthusiasm and Guillan proceeded to develop the Institute's abstracting into a far more systematic and complete service. He became Assistant Secretary in 1926 and Editor of Publications in 1937. In 1934 *Metallurgical Abstracts*, now having an unsurpassed international reputation, began to be published as a separate section of the *Journal*, which in 1931 had become a monthly publication.

It was when I was elected to the Council and the Publication Committee in 1924, and still more as Chairman of that committee (in succession to Walter Rosenhain, on his elevation to the Presidency in 1928) that I realized the value and extent of Guillan's work. Much of this was done outside working hours. He wrote many abstracts himself and organized and developed the whole service, as well as the general editorial work of the *Journal*, with the greatest efficiency and success. Authors of papers and abstracts, and the Publication Committee, have always had every reason to be grateful to Guillan, as indeed have also the thousands of readers of the *Journal* and of *Metallurgical Abstracts*.

On the outbreak of the Second World War, he was mobilized with his regiment in the Territorial Army, in which he had held a commission since 1926. In 1940 he was appointed to command a Regiment of anti-aircraft artillery, operational throughout the war in the anti-aircraft defences of Great Britain. He held the rank of Lieutenant-Colonel until he left the army in 1946. When, in that year, he resumed his service with the Institute, now as Assistant Secretary and Editor, he had served on the active list of the Regular or Territorial Army for nearly 26 years and was awarded the T.D.

In 1944 Mr. Shaw Scott was succeeded as Secretary of the Institute by Mr. K. Headlam-Morley, the Secretary of the Iron and Steel Institute, in accordance with a plan for closer collaboration between the two sister Institutes. This collaboration had an outcome of lasting importance in the formation of the Institution of Metallurgists, but rapid growth of membership made it necessary for each of the three bodies to have its own secretary and staff, and Colonel Guillan became Secretary of The Institute of Metals in 1947.

These fourteen years have been marked by a large annual increase of membership—see the straight and steeply rising graph in the March issue of the *Journal* (p. 257)—together with constant extension in the Institute's activities, in all of which Colonel Guillan has played an important, frequently a leading, part. Perhaps what has given him the greatest satisfaction, however, is the high standing reached by *Metallurgical Abstracts*. He was instrumental in securing for the Institute its fine house, No. 17 Belgrave Square, when the space available at No. 4 Grosvenor Gardens was no longer sufficient. The large overseas membership, now more than one-third of the total, has owed much to Colonel Guillan's efforts and to his popularity abroad. He took a special interest in the formation and development of the Powder Metallurgy Joint Group, and was its first secretary. He has been assiduous in visiting and encouraging the Local Sections and the Associated Societies.

The organization of meetings abroad and other special meetings has been most efficient. The Joint Meeting in 1955 in this country (followed by continental tours) in which two American, two British, and a number of continental metallurgical bodies participated, involved much preparation and detailed planning, in which Colonel Guillan took a large part. At this meeting Honorary Life Membership of the American Society for Metals and of the American Institute of Mining and Metallurgical Engineers was conferred on Colonel Guillan; more recently he has been made an Honorary Member of the Société Française de Métallurgie and a Fellow of The Institute

of Metals. His numerous friendships with leaders in metallurgical science and industry in many countries have been a valuable international asset to the Institute.

During the past year Colonel Guillan has taken an important part in what promises to be a significant development for metallurgical science and industry in this country. Closer collaboration between the metallurgical societies has long been advocated. Difficulties have now been overcome and a far-reaching and workable scheme will come into operation in 1962.

Colonel Guillan's unsparing devotion to the well-being of the Institute has not narrowed his interests. One of Mrs. Guillan's forebears was John Varley, who was not only himself a fine water-colourist but also a strong influence in the "golden period" of English water-colours in the early part of the nineteenth century. Colonel and Mrs. Guillan now possess a notable collection of water-colours by the Varleys, David Cox, Paul Sandby, and others, and have a wide knowledge of the principal collections in England.

I should like to conclude with my own tribute to Colonel Guillan's personality. One soon learnt to accept everything he said or wrote at its face value and to be sure that no ulterior motive was in view. His direct speech could be disconcerting, but this effect quickly evaporated in the genial warmth of his friendliness. He once told me that he likes people. This has the natural result that people like him.

HAROLD MOORE

PERSONAL NOTES

MR. I. A. BAILEY has been elected a Vice-President of The International Nickel Company of Canada, Ltd. He will continue as Chairman and Chief Officer of The International Nickel Company (Mond), Ltd., and of Henry Wiggin and Co., Ltd.

MR. N. D. BENSON is now with the Marshall Richards Machine Co., Ltd., Crook, Co. Durham.

MR. L. BERNSTEIN has been appointed Director of Research and Development, Alloys Unlimited, Inc., Long Island City, N.Y.

MR. W. O. BINDER, Assistant Director of Development with Union Carbide Metals Co., has been transferred to the Union Carbide Development Co., with headquarters in Geneva.

MR. P. J. BRAMHILL has left A. V. Roe and Co., Ltd., to take up an appointment in the Mechanical Test Department of English Electric Aviation, Ltd., Warton Aerodrome, near Preston.

MR. C. A. BROWN has left the British Thermostat Co., Ltd., and taken up an appointment at the Atomic Energy Research Establishment, Harwell.

MR. D. COLE is now with the Universal Metallic Packing Co., Ltd., Bradford.

MR. D. K. COUTTS, Managing Director of the Nickel Information Bureau Pty., Ltd., Melbourne, will be visiting the United Kingdom, Europe, United States, and Canada during April–August 1961. While he is in England, his address will be c/o The International Nickel Company (Mond), Ltd., Thames House, Millbank, London, S.W.1.

MR. C. J. DANGERFIELD has left The British Aluminium Co., Ltd., and is now a lecturer in the Chemistry and Metallurgy Department of Flintshire Technical College.

MR. G. D. DENYER has left Aluminium Laboratories, Ltd., to join Enfield Rolling Mills (Aluminium), Ltd., Brimsdown.

MR. E. V. DEWHIRST, Chief Metallurgist of Specialloid, Ltd., Leeds, has received the Insignia Award of the City and Guilds of London Institute for a thesis on "The Surface Treatment of Piston and Liner Assemblies for Internal Combustion Engines".

M. JACQUES DOUCET has retired from his position with Forges et Chantiers de la Méditerranée, but remains a consultant to the firm in the design of propellers.

MR. L. FAIRMAN is now at Sheffield College of Technology.

DR. C. G. GOETZEL has joined the Research Department of the Lockheed Missile and Space Division, as senior staff scientist. He will also lecture at Stanford University on powder metallurgy and refractory metals.

MR. R. HARDY is now a metallurgist on the staff of Samuel Fox and Co., Ltd., Stocksbridge, near Sheffield.

MR. D. M. HEADWORTH is now at the Orb Works, Newport, of The Steel Company of Wales, Ltd.

MR. J. O. HITCHCOCK has been elected an Assistant Vice-President of The International Nickel Company of Canada, Ltd. He remains Managing Director of The International Nickel Company (Mond), Ltd., and Deputy Chairman of Henry Wiggin and Co., Ltd.

MR. D. R. JORDAN has left Johnson, Matthey and Co., Ltd., to take up an appointment with its associate company Johnson, Matthey and Mallory, Ltd., Toronto, Ont.

PROFESSOR R. LEPSÖE has received from colleagues and friends, at a meeting of the Trondheim Section of the Norsk Metallurgisk Selskap, a presentation on the occasion of his retirement from the Chair of Metallurgy at the Norges Tekniske Høgskole, Trondheim.

MR. M. J. MAY has left Sheffield University and joined the staff of the British Non-Ferrous Metals Research Association.

DR. E. MEHL is now at Sherritt Gordon Mines, Ltd., Fort Saskatchewan, Alberta.

PROFESSOR R. MYERS, Head of the School of Metallurgy in the University of New South Wales, has been re-elected President of the Australian Institute of Metals (Sydney Branch).

M. A. SAULNIER, of the Compagnie Pechiney, has been awarded the Prix Charles Frémont by the Académie des Sciences.

MR. R. THOMSON has left Babcock and Wilcox, Ltd., and is now with the Department of Mines and Technical Surveys, Ottawa, Ont.

MR. T. C. WALLBANK is now Materials Engineer at Sir W. G. Armstrong Whitworth Aircraft, Ltd., Baginton, Coventry.

MR. M. G. H. WELLS has been awarded the Ph.D. degree of the University of London and is now a research engineer at the Graham Research Laboratory of Jones and Laughlin Steel Corp., Pittsburgh, Pa.

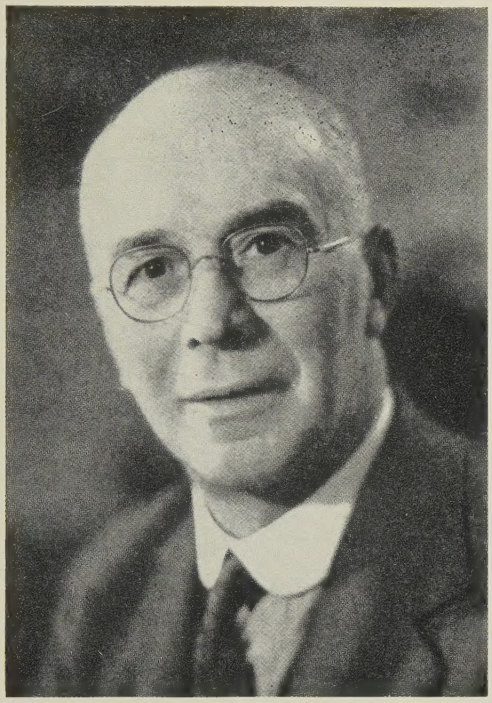
MR. A. L. WILSON has left Banbury and is now with Alcan Industries, Ltd., Auckland, New Zealand.

OBITUARY

Sir Arthur Smout

As briefly announced in the April issue of the *Bulletin*, Sir Arthur Smout, J.P., LL.D., a Past President of the Institute, died in hospital in Birmingham on 22 February 1961.

Arthur John Griffiths Smout was born on 18 November 1888, and his early business experience was gained at Elliott's



Metal Co., Ltd., Birmingham, which he joined as a student apprentice (trainee) in 1905. It was during these formative years that he enrolled as a student at the Birmingham College of Technology and, later, Birmingham University. During these part-time studies his name appeared frequently in the prize lists. Later, he was awarded the Insignia of the City and Guilds of London Institute.

Sir Arthur worked his way up in Elliott's practically from the shop floor to be Works Manager of the various factories in the Group, and eventually Production Director of all its activities, including William Cooper and Goode, Ltd., The Hughes Stubbs Metal Co., Ltd., Muntz Metal Co., Ltd., and the parent Elliott's Metal Co., Ltd.

On the formation of I.C.I. Metals, Ltd., in 1928 he was appointed Deputy Production Manager, shortly afterwards becoming Production Manager, and in 1932 he was appointed to the Board of the Metals Group, subsequently becoming Joint Managing Director. In 1936 he was appointed Chairman of what is now known as Imperial Chemical Industries, Ltd., Metals Division.

In 1944 Sir Arthur was invited to join the Main Board of Imperial Chemical Industries, Ltd., which he did, but to many of us who had been his close colleagues in Birmingham, he never really seemed to enjoy the change of environment. He had been a works man all his life and the parting of the ways was difficult and not quite natural to his rugged industrial background. During 1951, in addition to his responsibilities to the Main Board for the Metals Division, he also became responsible for the Nobel Division.

From 1942 to 1945 he served in the Ministry of Supply, under the late Sir Andrew Duncan, as Director General of Ammunition Production, a position he filled with conspicuous ability and for which he received the honour of a Knighthood in 1946.

Sir Arthur was keenly interested in the affairs of the Institute of Metals, of which he became a member in 1917, a Member of Council for the first time in 1924, and President in 1948–50. Probably he will best be remembered by members for the energetic drive he maintained, and that successfully, to enrol new members. He was elected a Fellow of the Institute in 1953.

The diversity of his interests can best be judged from the following brief details of his activities: Director, Imperial Chemical Industries, Ltd. (1944–53); Chairman, Murex Ltd. (1953–61); Director, Pyrotenax Ltd. (1937–61); Member, West Midlands Gas Board (1953–59); Birmingham City Magistrate (1942–61); Past President and Fellow, Institute of Metals; Vice-President, Institution of Mining and Metallurgy; Fellow, Royal Institute of Chemistry; Fellow, Institution of Metallurgists; Hon. Member, Metallurgical and Mining Society of South Africa; Associate, College of Technology (Birmingham); Past President, Birmingham Chamber of Commerce (1951); Life-Governor and Member of Council of Birmingham University; First President of Birmingham Accident Hospital.

In addition to the foregoing, he took a great interest in education, and during his service with I.C.I. Sir Arthur strove to foster closer relations between Industry and the Universities. This work was recognized by the University of Wales, which conferred on him the Honorary Degree of Doctor of Laws in 1954.

He was most assiduous in his duties as a magistrate, and it is of interest to recall that he had completed 500 sittings on the Bench just prior to his last illness.

Sir Arthur had a deep and abiding love of home and family, to which should be added his readiness at all times to go out of his way to help colleague, friend, or acquaintance in time of need. Although he never deliberately courted the limelight, he inevitably attracted it by his own dynamic personality. He had tremendous vitality and drive, always working at high pressure, perhaps without due care and regard for his own health and well-being. An overwhelming interest in men and matters of the day was coupled with an inborn spirit of fairness to all with whom he came in contact, and he was essentially a good leader of men.

Those of us who experienced his kindness and friendship will not forget them. Nor shall we forget how interesting and stimulating his comments could be on the wide range of human activity with which he had such close personal contact.

His sudden death came as a great blow to his many friends. I firmly believe that he had a great desire to live in order to continue his useful and devoted life to both his family and the many worthy causes in which he displayed so keen an interest. However, it was not to be, and he died from a heart attack on 22 February.

Sir Arthur, who was married in 1918, leaves a widow and four sons. The loss of his third son, Michael, in 1957 was a grievous blow from which he never seemed to recover fully. Many of his friends will trace the beginning of his somewhat indifferent health to this cause. Since his retirement from Imperial Chemical Industries, Ltd., he had been farming at Sherriff's Lench, near Evesham, Worcestershire.

His many friends will mourn him greatly and will feel deep compassion for his widow and family. H. E. JACKSON

Members and Guests at the Annual Dinner held at Grosvenor House, London, on 23 March, 1961

LOCAL SECTION NEWS

London Local Section Dinner

The fourth annual informal dinner of the London Local Section was held on 9 March at the Horse Shoe Hotel, Tottenham Court Road, London, W.1. The principal guest was Mr. H. GOODGER, of the National Boiler and General Insurance Co., Ltd. The Chairman of the Section, Mr. E. G. V. NEWMAN, presided.

LECTURES TO LOCAL SECTIONS AND ASSOCIATED SOCIETIES

The Use of Aluminium in Transport

At the meeting of the South Wales Local Section on 11 October 1960, Mr. H. S. STUBBS (Imperial Aluminium Co., Ltd.) spoke about " The Use of Aluminium in Transport ".

In his lecture, Mr. Stubbs dealt with the application of aluminium alloys in marine, road, and rail transport (aircraft, being a rather specialized subject, was not considered).

World production of aluminium today was of the order of 4 million tons per annum, of which approximately 25% was used in transport. In general, commercial aluminium and the aluminium–manganese alloys were used for decorative purposes, whilst the non-heat-treatable aluminium–magnesium and the heat-treated aluminium–magnesium–silicon alloys were used for structural, stress-bearing components.

After summarizing the mechanical properties of the alloys recommended, the lecturer proceeded to explain the principles of design in aluminium, comparing them with those in steel construction. The modulus of elasticity of aluminium being only one-third that of mild steel meant that, where deflection was limited, a greater moment of inertia, and hence a greater volume of aluminium than steel, had to be used. Not only, therefore, were stresses in aluminium generally lower than those in a corresponding steel design and hence high-strength alloys were not usually necessary, but also the saving in weight was only about 50% of the steel replaced and not the full difference of two-thirds that might be expected.

The development of argon-arc welding had increased interest in the possibility of welded structures and the use of the non-heat-treatable aluminium–magnesium alloys in preference to the heat-treated aluminium–magnesium–silicon alloys which were annealed and were therefore weakened in the weld zone.

The second part of the lecture dealt with applications in the three fields mentioned and was illustrated by lantern slides.

Owing to the lack of suitable alloys, developments in the marine field had been slow, but the introduction in 1930 of the aluminium–magnesium and aluminium–magnesium–silicon alloys had led eventually to the building, in America in 1952, of the liner *United States*, in which 2000 tons of aluminium, mostly aluminium–magnesium–silicon alloy, had been used in the riveted deck-houses, &c., and to the use today in this country of 1000 tons each in the *Oriana* and *Canberra* for the welded aluminium–magnesium deck houses, &c.

Development in road transport had culminated in the wide use of special interlocking sections for lorry-body construction and of sheet and standard and special extrusions for bus bodies, van bodies, special commercial and municipal vehicles, &c. A more recent development was the combination of aluminium sheet and a polyurethane rigid foam in sandwich panels as vehicle body structures, with the elimination of conventional framing.

From 1906, when the first aluminium-panelled rail coach was put into service on the Liverpool–Southport electric line, to 1946, the growth of aluminium usage in rail transport was slow. In that year, the London Passenger Transport Board (now L.T.E.) and later the London Midland Region of British Railways, had sought the collaboration of ICI, Metals Division, and the coachbuilders in the design of aluminium alloy rolling stock. Now, 103 L.T.E. surface line cars and 550 British Railways diesel rail cars of all-aluminium alloy construction were in service. The policy of L.T.E. was to use all-alloy, unpainted, cars for surface lines and unpainted alloy-panelled cars for the tube lines.

The introduction of diesel, diesel–electric, and electric locomotives had created a need for lightweight construction to meet axle loadings, and aluminium alloy riveted and welded bodies, cabs, and ancillary equipment provided a solution to this problem.

This is one example of the increasing use of aluminium in the transport field and can be paralleled by similar activities of other British aluminium manufacturers, to some of whom undoubtedly the great development of applications in, for example, the marine field are due.

Beryllium as a Structural Material

In a lecture to the Scottish Local Section on 13 February 1961, Dr. A. J. MARTIN (Atomic Weapons Research Establishment) dealt with " Beryllium as a Structural Material ".

The advantages of beryllium as a reactor material, and as structural components in space vehicles and high-speed aircraft were discussed, together with the attendant disadvantages of cost, health hazards, and lack of ductility. The ductility aspect was of major importance, and problems arose both at room temperature and, in reactor technology, at temperatures of the order of 600° C. The room-temperature brittleness was essentially a problem of failure by cleavage, and the effect of bend-plane, kink-band, and twin formation on this. At higher temperatures, intergranular failure predominated Both mechanisms had been studied at AWRE, and particularly the effects of impurities, crystallographic texture, grain size, and thermal treatments. The results of these studies were discussed with particular reference to the future of the beryllium industry.

New Aspects of the Electron Theory of Metals

At a meeting of the Oxford Local Section on 7 February 1961, Dr. V. HEINE (Cavendish Laboratory, Cambridge) gave a lecture on " New Aspects of the Electron Theory of Metals ".

He said that although the general theory of the motion of electrons in a metal dated back to the early 1930's, we were only now beginning to obtain a detailed picture of the electrical and magnetic properties of particular metals. A variety of advances had made progress on this front possible, particularly the availability of some metals in the form of single crystals of extremely high purity. In the case of other metals the preparation of adequate specimens was still the major obstacle.

In 1928 Sommerfeld's theory of a free electron gas applied to the electrons in a metal, provided one of the major achievements of the (then) new quantum mechanics. However, there had remained many quantitative discrepancies with

experiment, for instance the sign of the thermo-electric power of the noble metals, because the theory did not take into account the effect of the anisotropy of the crystal lattice on the motion of the electrons. What was really needed was the actual shape of the Fermi surface inside the Brillouin zone scheme, the velocity of the electrons at each point on the Fermi surface, and their rate of being scattered by thermal vibrations of the lattice and by impurities. Clearly a single quantity, such as the electrical conductivity, did not contain enough information for this purpose, but some of the more obscure phenomena, such as the "ultrasonic callipers" (attenuation of ultrasonics in the presence of a magnetic field), the de Haas–van Alphen effect, the anomalous skin effect, and cyclotron resonance, allowed one to measure more or less directly the required quantities. As a result, the shapes of the Fermi surface in the noble metals were fairly well known; in each case they showed a bulge in the (111) directions, so that the Fermi surface actually touched the faces of the Brillouin zone. In the case of the alkali metals there was only qualitative indirect evidence, which indicated that the Fermi surface in sodium was very nearly spherical, becoming progressively more distorted in potassium, rubidium, and cæsium, and being also very distorted in lithium. This correlated well with various other properties, for instance the electrons' mean free path in the molten metal. For polyvalent metals some very complicated shapes were conjectured for the Fermi surface.

In the question period after the lecture, there was considerable discussion about, among other things, why the collisions between the electrons themselves did not lead to a short mean free path even in samples of very high purity.

The X-Ray Microanalyser as a Research Tool for the Metallurgist

On 25 January 1961 members of the Manchester Metallurgical Society heard a lecture on "The X-Ray Microanalyser as a Research Tool for the Metallurgist" by Dr. D. A. Melford (T. I. Research Laboratories).

He said that the three essential components of an electron probe microanalyser were: (*a*) a finely focused electron beam, (*b*) an X-ray spectrometer, and (*c*) a means of positioning the probe accurately on the specimen, especially in relation to the microstructure as revealed by the optical microscope. The way in which these three essentials had been embodied in practical instruments by various workers was described in some detail. In Europe these developments had so far led to the evolution of three commercially available instruments.

It was suggested that the technique of X-ray scanning microanalysis initiated by Cosslett and Duncumb at the Cavendish Laboratory, Cambridge, offered many advantages to the metallurgist. In this type of instrument the electron probe was scanned over a square raster on the specimen, and both emitted X-rays and back-scattered electrons were detected. In this way it was possible to form two images of the specimen surface: an electron image (very similar in appearance to an optical image taken in oblique illumination) and an X-ray image revealing the distribution of a selected element over the field of view. The images were displayed side by side for comparison on two fluorescent screens and could be at any magnification between 200 and 2000×. By stopping the scan and positioning the probe with reference to either of these images, the instrument could also be used as a static probe microanalyser to obtain a quantitative analysis from a point approximately 1 μ in dia.

Several examples of the use of this technique were discussed, among them the analysis of complex non-metallic inclusions in steel and also of mixed inclusions, e.g. spinels and sulphides. The enrichment of residual elements in the subscale of mild steel was also being investigated with the aid of such an instrument. Nickel, copper, tin, antimony, and arsenic had been found to accumulate at the surface of commercial mild steel during oxidation at 1100–1300° C.

There were sometimes cases in which it was possible to study specimens which could not be examined under the optical microscope. To illustrate this point the examination of several fracture surfaces was described. Here the greater depth of focus of the electron image and its capacity for revealing contrast as a result of differences in atomic number had been found most useful.

Finally, the limitations of the technique were discussed. These lay principally in the resolution—no better than 1 μ for most analyses—and also in the inability to analyse for elements of atomic number less than 12 (Mg). It was suggested that the prospect of surmounting these difficulties was much brighter now than it had been two or three years ago, and progress was being made towards this end at several centres.

Alloys and Techniques of the British Bronze Age

Dr. R. F. Tylecote (King's College, Newcastle-upon-Tyne) gave a lecture on "Alloys and Techniques of the British Bronze Age" to the Leeds Metallurgical Society on 7 February 1961.

He said that during the Early Bronze Age, which began in England in about 1800 B.C., three metals were used: a nearly pure copper with impurity limits of about 0·2%, which was probably derived from oxide ores; an arsenical copper which contained about 2·5% As, and which probably came from the Fahlerz or grey copper ore (Cu_3AsS_3, in which As is replaceable by Sb); and a 10% tin bronze which had a low As content. Recent discussions among archæologists had led to the proposal to split this period into a Copper Age and a true Early Bronze Age.

During the Middle Bronze Age (i.e. after about 1350 B.C.), the main alloy used was the 10% tin bronze. To this, about 5% of lead was added during the Late Bronze Age, which began about 1000 B.C. Most of the implements of the British Bronze Age were cast, but there seemed to have been a tendency to limit the lead content of the few wrought products of the Late Bronze Age to about 1%, while still maintaining the tin content at about 10%.

There was little evidence of the smelting technique used, but the pure copper plano-convex ingots found in Late Bronze Age hoards suggested that smelting had been carried out in bowl hearths with a bellows blast.

In the early periods, casting was carried out in moulds of sandstone or steatite. Many of those found were one-piece or open moulds, but by the Middle Bronze Age two-piece moulds were common. In the Late Bronze Age clay and bronze moulds were normal, and there was some evidence for the casting of lead patterns into bronze moulds. If these patterns had been used for investment moulding, evidence was still lacking, since all the clay moulds found were of the two-piece type. It was extremely probable that clay had been used earlier than the Late Bronze Age, but if so no evidence had survived; bronze moulds appeared to have been introduced in the Middle Bronze Age for palstaves.

Flat axes were in existence which weighed as much as 9 lb, and which had probably been cast in open moulds with considerable wastage. The majority of castings fell into the

definition of chill castings, since they were thin-sectioned and had been cast without feeding. Segregation of tin (i.e. tin sweat) was the probable process by which some of the early axes had become " tin-plated ". The leaded bronzes, owing to their being chill cast, showed little sign of gravity segregation of lead.

Chaplets had been widely used where necessary, as in the cast Late Bronze Age trumpets. In contrast to the clay moulds, cores were made of sand–clay mixtures. Rivets seemed to have been turned to good account in the case of some Irish sheet-metal cauldrons, in which heat transfer had been improved by the projection of enormous numbers of rivets from the outer surface by about $\frac{3}{8}$ in.

POWDER METALLURGY JOINT GROUP

Discussion on " The Appraisal of Powders for Pressing and Sintering "

A discussion on " The Appraisal of Powders for Pressing and Sintering " was held at the Royal Commonwealth Society, London, on 17 and 18 April. Synopses of the papers discussed are given below. The complete papers are published in *Powder Metallurgy* No. 7.

Techniques for the Evaluation of Powders. I.—Fundamental Properties of Particles and Methods of Sizing Analysis

By Harold Heywood

(*The Woolwich Polytechnic, London*)

The author has summarized the results of thirty years' research on the properties of powdered materials. These studies have been concerned with powders of all types, but most of the conclusions are applicable to metallic powders. The complex properties of powders can be resolved only by first defining those fundamental properties that can be measured individually: the first section of the paper defines these and shows how they may be combined to assess the more complex properties, according to the nature of the problem and the circumstances of usage. The second section describes the essential features of methods for the sizing analysis of powders, with brief consideration of their characteristics and some indication of recent tendencies in the application of electronic devices and automatic recording.

Techniques for the Evaluation of Powders. II.—The Bulk Properties of Metal Powders

By P. R. Marshall

(*Metal and Plastic Components, Ltd., Birmingham*)

Current methods of sampling and determination of flow, apparent and tap density, particle size " fillability ", and " hydrogen loss " are reviewed. The general conclusion is that present tests are adequate, but that new tests more suited to powder usage should be devised.

Techniques for the Evaluation of Powders. III.—Observations on Compacts

By V. T. Morgan

(*Bound Brook Bearings, Ltd., Lichfield, Staffs.*)

A large number of tests based on observations made on compacts have been devised to evaluate the pressing and sintering characteristics of metal powders. These are summarized under four headings: behaviour during pressing, properties of the green compact, behaviour during sintering, and the properties of the sintered compact. The specifications which set down standard testing techniques are described and reviewed. The principles involved in the various proposed tests are given, together with any limitations or precautions that need special consideration. In a number of cases there is obvious scope for further study and research, and these are pointed out.

Measurement of the Surface Area of Powders by the BET Method

By B. C. Lippens

(*Koninklijke Zwavelzuurfabrieken v/h Ketjen N.V., Amsterdam, Netherlands*)

and M. E. A. Hermans

(*N.V. Keuring van Elektrotechnische Materialen, Arnhem, Netherlands*)

Some experimental aspects of the construction and use of a conventional BET apparatus are discussed. Certain improvements in the method of measuring adsorption and in the size of the equipment resulted in the development of the " micro BET " apparatus described here. A considerable simplification in the technique of measurement has been attained. The application of the apparatus is demonstrated by examples.

A Comparative Study of Methods for Particle-Size Analysis in the Sub-Sieve Range

By H. F. Fischmeister and C. A. Blände

(*Jernkontorets Powder Metallurgy Laboratory, Metallografiska Institutet, Stockholm*)

and S. Palmqvist

(*Fagersta Bruks AB, Fagersta, Sweden*)

Eleven powders of widely different properties (various grades of WC, WO_3, tungsten, iron, cobalt, SiO_2, Al_2O_3), considered typical of the raw materials encountered in powder metallurgy, have been studied by " single-value methods " (apparent and tap density, air permeametry, gas adsorption (BET)) and by " size-distribution methods " (electron- and light-microscope sizing, turbidimetry, sedimentation balance (with gaseous and with liquid medium), centrifugal air classification, and sieve analysis). In addition, a series of WC powders having varying degrees of fineness has been studied by air permeametry, gas adsorption, optical reflectivity, turbidimetry, and sedimentation in air, to assess the reliable working ranges of these methods.

The following topics are treated in detail: air-permeability measurements and their relation to the results of BET and other tests; electron- and light-microscope sizing techniques; turbidimetry; and optical reflectivity. A microscopic study of the breakdown of agglomerates in a tungsten carbide powder is reported. The importance of large agglomerates in all work concerned with particle-size distributions is stressed. For highly agglomerated powders the size distribution of the ultimate units (individual particles within agglomerates) is difficult or impossible to determine, but it is pointed out that this " true " distribution has much less technical significance than that of the agglomerated powder, provided that the degree of agglomeration in which the powder is analysed corresponds to, or can be correlated with, that prevailing in the process for which it is intended.

The Relationship Between Powder Properties and the Pressing and Sintering Behaviour of Beryllium

By A. J. Martin and G. C. Ellis

(*Atomic Weapons Research Establishment, Aldermaston, Berks.*)

The paper surveys the existing routes available for the preparation of beryllium powders, and comments on the effect of certain properties, such as particle-size distribution, on the compaction of powders by different techniques. It is emphasized that particle size, degree of oxidation, and overall purity are interdependent variables, and that little attempt has so far been made to study their effects separately.

The Powder Metallurgy of Ruthenium

By R. G. Cope and D. W. Rhys

(*The Mond Nickel Co., Ltd., Development and Research Department, London*)

An investigation of the powder metallurgy of ruthenium is described, from the reduction of ammonium ruthenium chloride to the working of sintered compacts. The powder properties measured were specific surface area, by a simplified BET method, and tap density. The dependence of these properties on the conditions of reduction has been determined. The surface area of powders varies from 1–10 m^2/g in the temperature-of-reduction range 700–350° C. The tap density is also variable (1–3 g/c.c.) and is generally related to the surface area. The effects of compacting pressure and temperature on sintering are described, the progress of sintering being observed by measurements of the "open" and "closed" porosity present in samples. Compact densities up to 95% of theoretical can be obtained by sintering at 1500° C. The selection of powder properties and compacting pressures to be used in the production, by vacuum sintering at 1500° C, of high-density compacts for working, is governed by the necessity to maintain open porosity during the heating cycle up to at least 1200° C, as considerable gas evolution occurs at this temperature; at the same time it is essential that good densification shall have occurred even at this stage. These conditions can be met by using powder with a surface area of 2–5 m^2/g and compacting pressures in the range 0·5–25 tons in^2.

Observations on the hot working of sintered compacts indicate that ease of working is related to the surface area of the powder.

Relationship Between the Properties of Tantalum and Niobium Powders and Their Sintering Behaviour

By Jiří Vacek

(*Powder Metallurgy Research Institute (VÚPM), Prague*)

Experiments have been carried out to determine the relationship between the properties of tantalum powder and its compressibility, and to examine the effect of carbon and niobium on the hardness and tensile and electrical properties of semi-manufactured products of tantalum. The influence of the particle-size distribution of niobium powder upon the properties of sintered bars has also been studied, with particular reference to the problem of swelling of the bars during sintering.

The Effect of Surface Characteristics on the Sintering of Uranium and Beryllium Powders

By J. Williams, J. W. S. Jones, and K. H. Westmacott

(*Atomic Energy Research Establishment, Harwell, Berks.*)

Studies of the sintering of uncompacted uranium powders in vacuum have shown that sintering behaviour is markedly affected by the nature of the surface films on the powder. Of the variables in the powder-production route that might affect the nature of the surface films, the leaching stage is the most important.

The deleterious effect of surface contaminants on the vacuum-sintering behaviour of beryllium is demonstrated. During the development of a technique for the production of a stable powder from electrolytic flake, the nature of the leaching treatment again proved to have a marked influence on the sintering behaviour of the resultant powder.

Both sets of investigations were hampered by lack of methods for identification of surface films on powders.

Physical Methods for Investigating the Properties of Oxide Powders in Relation to Sintering

By P. J. Anderson and D. T. Livey

(*Atomic Energy Research Establishment, Harwell, Berks.*)

By the application of several modern techniques, a fairly thorough characterization of even the finest oxide powders with respect to particle and crystallite size and shape may be obtained. The application of these techniques is discussed with particular reference to the characterization of a sample of $Mg(OH)_2$ and the oxides prepared from it by calcination *in vacuo*. The techniques described are, however, exacting and time-consuming and whilst invaluable for any basic study cannot, in general, be considered practicable in routine work. For this reason a final section is devoted to a discussion of attempts to "calibrate" the results from conventional techniques in terms of the more fundamental parameters of powder characterization.

Porous Bronze: The Effects of Some Powder Characteristics on the Pressing and Sintering Properties

By A. E. S. Rowley

(*Bound Brook Bearings, Ltd., Lichfield, Staffs.*)

The various tests usually applied to powders for the manufacture of porous bronze are listed. Stress is laid on the importance of consistency of materials. Variations in the important properties of each of the metallic and non-metallic ingredients, and their effect on pressing and sintering behaviour, are discussed. The conclusion reached is that a compromise on powder properties must be accepted in order to achieve economic production.

The Pressing and Sintering Properties of Iron Powders

By G. Zapf

(*Sintermetallwerk Krebsöge GmbH, Krebsöge/Rhld., Germany*)

Some twenty different iron powders are available in Europe for the manufacture of sintered bearings and structural parts. These powders can be grouped under four headings: reduced, atomized, comminuted, and electrolytic. Details are given of the experience gained in testing these types of powder by the methods in common use in the metal-powder industry.

The influence of the data thus obtained on the processing, in particular the pressing and sintering conditions, of iron powders is discussed in detail. Consideration is given to the way in which the properties of the powders affect their sinterability, the pressing operation and tool design, and also the physical characteristics of the finished product.

Some Problems in the Powder Metallurgy of Titanium

By S. E. Rogers

(*The General Electric Co., Ltd., Wembley*)

An investigation is described of problems encountered in the conventional powder metallurgy of titanium, with particular reference to the pressing and sintering characteristics of titanium and titanium hydride powders and to sources of contamination. It is concluded that, for success to be achieved in the production of fully dense sintered material by the present method without incurring serious contamination, commercial titanium would have to be available as powder conforming to strict purity requirements.

" Powder Metallurgy ", No. 7

In addition to the above papers, *Powder Metallurgy* No. 7 also contains the following:

The Forming of Hollow Shapes in Beryllium by Loose Sintering

By A. J. Martin, R. A. Knight, and G. C. Ellis

(*Atomic Weapons Research Establishment, Aldermaston, Berks.*)

Two methods for forming shaped bodies in beryllium by powder metallurgy are described and compared. The requirements for uniform densification during hot pressing are discussed, and it is concluded that a double-pressing method is essential if thin-walled hemispherical shapes are required.

Titanium–Aluminium–Manganese Alloys Prepared by Powder-Metallurgical Techniques

By M. F. Grimwade

(*The General Electric Co., Ltd., Wembley*)

The preparation of titanium hydride powder and the method of adding aluminium and manganese are described. Sintered materials had poor ductility and this is attributed to the presence of an acicular structure. The tensile strength and ductility of sintered and forged alloys, in which the acicular structure is destroyed, were as good as, and in some cases superior to, those of the equivalent conventional cast and wrought alloy. Both the sintered and the sintered and forged material exhibited good creep properties at 200 and 400° C. Attempts to destroy the acicular structure of the sintered alloy by heat-treatment were unsuccessful.

A Preliminary Study of the Reactions Between Tungsten Carbide and Tungsten Carbide–6% Cobalt Powders and Wet and Dry Hydrogen

By G. E. Spriggs

(*Hard Metal Tools, Ltd., Coventry*)

The apparent activation energy for the following reactions has been determined by measuring the amount of carbon removed from samples of powder heated to various temperatures in an atmosphere of either dry or wet hydrogen:

Dry Hydrogen

(*a*) " As-carburized " tungsten carbide: no reaction up to 900° C.

(*b*) Water-milled tungsten carbide: 8·38 kcal/mole over the range 600–900° C.

(*c*) Water-milled tungsten carbide + 6% cobalt: complex reaction over the range 600–900° C.

Wet Hydrogen

(*a*) " As-carburized " tungsten carbide: 58·1 kcal/mole over the range 800–900° C.

(*b*) Water-milled tungsten carbide: 34·8 kcal/mole over the range 700–900° C.

(*c*) Water-milled tungsten carbide + 6% cobalt: 38·4 kcal/mole over the range 825–900° C; 7·38 kcal/mole over the range 600–800° C.

It has been shown that ball-milling in water changes both the physical and chemical properties of tungsten carbide powder. These changes are discussed in relation to the marked differences in reaction rates. A number of possible reasons for these differences are given.

Powder Metallurgy, which appears twice a year, is the official organ of the Powder Metallurgy Joint Group. It is obtainable by annual subscription at 25*s*. (post free) to non-members; members of The Iron and Steel Institute and The Institute of Metals may obtain it for an annual fee of 10*s*. (post free).

JOINT ACTIVITIES

Symposium on the Physics of Sectioning and the Embedding Process

The Joint British Committee for Electron Microscopy, on which the Institute of Metals is represented, is associated with the Electron Microscopy Group of the Institute of Physics and Physical Society in organizing a one-day symposium on " The Physics of Sectioning and the Embedding Process." This will be held on Friday, 14 July 1961, at the University of Nottingham, immediately after the annual conference of the Electron Microscopy Group. It is intended that the symposium shall be concerned with the mechanism of sectioning and with studies on the action of glass and diamond knives. Papers on embedding materials and on their behaviour in the electron beam are also to be included. If time permits, there may also be papers on staining (specificity, electron scattering power, &c.).

Anyone wishing to attend should inform the Hon. Secretary of the Electron Microscopy Group (Dr. R. Reed, Department of Leather Industries, The University, Leeds 2) not later than 7 June, but preferably earlier to facilitate planning, especially if accommodation in the Halls of the University is required.

OTHER NEWS

Société Française de Métallurgie

The Autumn Meeting of the Société Française de Métallurgie will be held on 16–20 October at the Maison de la Chimie, 28 bis, rue St. Dominique, Paris 7ème.

The main theme of the meeting will be " The Forming of Metals ", covering hot and cold deformation and including casting and sintering. Papers on other subjects will also be presented.

Information may be obtained from the Société, 25 rue de Clichy, Paris 9ème.

DISTORTION IN TOOL STEELS

A NEW BOOK PUBLISHED BY AMERICAN SOCIETY FOR METALS

Distortion in Tool Steels is a practical, easy-to-read book exploring the size and shape changes in tool steels which occur during and after processing.

Readers will benefit greatly from the experience of its author. Dr. Lement's background includes both theoretical and practical work in this field and in this book he has sorted the most useful data yet assembled on this expensive problem to industry. His comprehensive knowledge has resulted in this first-of-its-kind book for metals and materials engineers, tool engineers, designers, heat treaters, machinists, mechanical engineers and inspectors.

Dr. Lement places particular emphasis on methods of heat treatment that are necessary for precise dimensional control. The problems encountered in the production of tool steel parts with extreme tolerances (cutting tools, dies, gages, ball bearings, valves, etc.) are treated in detail.

Also, how to prevent significant changes in finish dimensions during storage or under normal service conditions is discussed. How to minimize or eliminate costly finish machining operations by scientific dimensional control is thoroughly explored.

Tables, drawings, charts and graphs highlight the book's eight chapters:

1. CAUSES OF DISTORTION
2. MEASUREMENT OF DIMENSIONAL CHANGES
3. CALCULATION OF SIZE CHANGES
4. CONTROL OF DISTORTION
5. HARDENING
6. COLD TREATING
7. TEMPERING
8. AGING

If you are directly or indirectly related to the manufacture of tool steels or tool steel parts, *Distortion in Tool Steels* is a work of great importance. Dr. Lement writes to the men responsible for tool steel performance. His book represents an opportunity to become fully informed on size and shape changes in tool steels. Order your copy today.

ORDER WITH THIS COUPON

Distortion in Tool Steels—173 P.—8 chapters—illustrated—red cloth cover—6″ × 9″—published by American Society for Metals—written by Dr. Bernard S. Lement—$10.00 per copy. Please add $1.00 for postage.

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AMERICAN SOCIETY FOR METALS

Metals Park—Novelty, Ohio

Chevenard Lecture

The Société Française de Métallurgie has instituted a Chevenard lecture in memory of the late Professor Pierre Chevenard. The first such lecture, dealing with the research work of Professor Chevenard and its continuation, was given in Paris on 19 April by M. Xavier Waché, Director of Research of Société Métallurgique d'Imphy.

Sixth International Galvanizing Conference, Interlaken 4–9 June 1961

The Sixth International Galvanizing Conference will be held at Interlaken from 4 to 9 June 1961. It is expected that about 500 galvanizers from many countries will meet at Interlaken to discuss the latest developments in the theory and practice of hot galvanizing.

Copies of the Preliminary Notice, which contains a registration form, may be requested from the Zinc Development Association, 34 Berkeley Square, London, W.1. All those wishing to attend the Conference as delegates should write without delay, in order to ensure accommodation at hotels of their choice.

Twenty-three papers will be presented by experts from Europe, Canada, Australia, and the U.S.A. Technical sessions will be held on bath heating, the metallurgical aspects of the process, welding, and after-treatments for galvanized steel. In addition there will be a session on works' practice and informal discussions on management problems (of particular interest to jobbing galvanizers) and other special sessions on sheet, strip, and wire galvanizing.

In conjunction with the conference there will be works visits to jobbing plants in Switzerland and to strip, wire, and tube galvanizing plants in Italy. Exhibitions of equipment and materials used in galvanizing and of applications for galvanized steel are also being arranged.

An interesting programme of excursions has been planned for the ladies.

Gordon Research Conferences

The 1961 Gordon Research Conferences include two subjects of interest to metallurgists: (1) "Imperfections, Substructure, and Microstructure" to be held on 26–30 June at Kimball Union Academy, Meriden, N.H.; and (2) "Electrodeposition" to be held on 31 July–4 August at Tilton School, Tilton, N.H.

Requests for attendance at the conferences, or for additional information, should be addressed to W. George Parks, Department of Chemistry, University of Rhode Island, Kingston, R.I.

Deutsche Gesellschaft für Elektronenmikroskopie

The Annual Meeting of the Deutsche Gesellschaft für Elektronenmikroskopie will be held at the Anatomische Institut, Kiel. Enquiries about the meeting should be made to Dr. H. Kehler, Farbwerke Hoechst AG., Frankfurt/M. Hoechst.

Rheological Techniques

The British Society of Rheology and the Non-Destructive Testing Group of the Institute of Physics and Physical Society are to hold a joint meeting on "Rheological Techniques" at Llandudno on 21 and 22 September 1961. The aim of the meeting will be to discuss rheological techniques in detail. Usually, in the presentation of a paper, discussion of experimental results is given at the expense of the description of the techniques. It is intended that on this occasion the opposite shall be true. The proceedings of the meeting will be published in special issues of *Laboratory Practice*. Contributions to the meeting are invited, and intending speakers should write to Dr. M. F. Gulpin, 8 The Broadway, Pontypool, Mon., as soon as possible.

Symposium at Borough Polytechnic

A one-day symposium is being arranged by the Division of Metal Science at Borough Polytechnic on 6 July, dealing with "Internal Stresses in Electrolytically Produced Coatings and Their Effect on the Properties of the Basis Metals."

Details can be obtained from Mr. G. Isserlis, Borough Polytechnic, Borough Road, London, S.E.1 (WATerloo 7654).

Powder Metallurgy Progress Award

The Board of Governors of the Metal Powder Industries Federation, of New York, announces that the Federation will sponsor an award for outstanding contribution to the advancement of the metal-powder and powder-metallurgy industry. It will be known as the MPIF "Powder Metallurgy Progress Award" and will be made to an individual or institution, regardless of nationality, whose efforts have contributed substantially to the advancement of the industry.

International Conference on "Surface Treatments for Aluminium"

The fifth international conference of the "Centro Leghe Leggere" of the Associazione Italiana di Metallurgia will be held in Milan on 7–9 October 1961. The subject will be "Surface Treatments for Aluminium."

This meeting will also be the occasion of the fourth award of the Guido Donegani Gold Medal for the metallurgy of the light metals.

APPOINTMENTS VACANT

COLLEGE OF ADVANCED TECHNOLOGY, BIRMINGHAM

Applications are invited for the following posts:

PRINCIPAL LECTURER IN PHYSICAL METALLURGY
PRINCIPAL LECTURER IN INDUSTRIAL METALLURGY

Candidates should be qualified to teach up to post-graduate level and to conduct project, research, and development work. Successful candidates will be expected to assist (*a*) in the development and co-ordinating of laboratory work, (*b*) with a limited amount of administrative work, and will be encouraged to develop industrial contacts.

SENIOR LECTURER and LECTURER to specialize in a branch of Metallurgy such as Foundry Technology, Fabrication and Thermal Treatment, Corrosion and Metal Finishing.

Salary:	Principal Lecturers	£1,750–£1,900
	Senior Lecturers	£1,550–£1,750
	Lecturers	£1,370–£1,550

Further particulars and forms of application may be obtained from the Bursar, College of Advanced Technology, Gosta Green, Birmingham 4. Applications to be received within 14 days of this advertisement.

K. R. PILLING, Clerk to the Governors.

AEON LABORATORIES require Junior Metallurgists, preferably with experience in ferrous metallography, for interesting projects involving electron-microscope examination of a wide range of steels and other materials, including sintered powders. Good salaries are paid to suitable applicants. Pleasant working conditions. 5-day week. Pension Scheme. Apply, with details of qualifications and experience, to Aeon Laboratories, Beech Hill, Ridgemead Road, Englefield Green, Egham, Surrey.

SOUTH-EAST ESSEX TECHNICAL COLLEGE
Longbridge Road, Dagenham

Required September: ASSISTANT LECTURER (Grade "B") in METALLURGY. Applicants should have a degree or equivalent qualification, with teaching experience, and be able to teach to Higher National Certificate standard. Industrial experience is also desirable.

Salary scale: £700 × £27 10*s.* 0*d.*–£1150 per annum, plus London Allowance (£38 or £51).

In assessing the commencing salary, increments above the scale minimum will be allowed for approved teaching, research, or industrial experience and national service. Additions to the salary scale will also be allowed for approved training and qualifications if in accordance with Burnham Further Education Report.

Application form and further particulars from the Clerk to the Governors.

ZINC DEVELOPMENT ASSOCIATION

NEEDS

Qualified metallurgists, chemists, or engineers, preferably with some industrial experience, for technical and promotional work on applications of zinc. The ability to express yourself clearly in speech and writing is essential. Please write to the Director, stating your educational qualifications and details of your career. Pension scheme.

NEEDS

Young men or women to work as junior technical officers in its library, which is shortly to be combined with that of the Lead Development Association. The work will be mainly searching for and abstracting English and foreign articles on the technology, metallurgy, and chemistry of zinc and lead and their alloys and compounds. It will also include answering enquiries for technical information, compiling bibliographies and helping with the reclassification of the extensive contents of the joint libraries. Applications will be welcomed from people who have either recently taken a degree in physical science or will do so this summer. Please write to the Director, stating your qualifications, if you would like to come for an interview. Pension scheme available.

34 Berkeley Square,
LONDON, W.1.

RESEARCH
METALLURGISTS, PHYSICISTS, AND CHEMISTS

are invited to apply for appointment to the Staff of the Development and Research Department Laboratory

of

THE INTERNATIONAL NICKEL COMPANY (MOND), LIMITED,
Birmingham

These vacancies, resulting from continuing expansion, occur in sections of the Laboratory dealing with high-temperature creep-resisting alloys, alloy steels, powder metallurgy, corrosion, electrochemistry, welding, physical methods of analysis and X-ray crystallography, and general studies of the structure and properties of alloys.

The work of the Laboratory covers a very wide field of ferrous and non-ferrous metallurgy and the most advanced equipment is available to aid research. Members of the staff have personal responsibility for the work they conduct or supervise and every opportunity is provided for the publication of results.

Vacancies exist both for men with experience in particular fields of metallurgical or allied research and for graduates without research experience. Salaries will be appropriate to qualifications and experience.

Pension and assurance schemes are in operation and, in appropriate cases, assistance can be given for housing. Applications, which will be treated in confidence, should give details of age, qualifications, and experience. They should be addressed to The Research Manager, D. and R. Dept., The International Nickel Company (Mond), Ltd., Thames House Millbank, London, S.W.1. Please mark envelope "Confidential L.88" G.

ASSISTANT METALLURGIST

Applications are invited for the post of Assistant Metallurgist for general metallurgical development work on cast materials to cope with the increasing activities of the Company.

Development projects include:

(*a*) High and ultra-high tensile steels,
(*b*) Hardenable stainless steels,
(*c*) Welding and casting characteristics,

of low-alloy, stainless, and heat-resisting steels, as well as a wide range of nickel-base alloys.

Applicants should be under 30 years of age and have a metallurgical degree or H.N.C. in the subject. Previous experience in founding or welding industries an advantage.

Applications, stating age, qualifications and experience should be addressed to:

The Managing Director,
A.P.V.-Paramount Limited,
Manor Royal,
Crawley, Sussex.